ISSN 2335-8408

HOW A READER TITLED ADVENTURES IN THE PLAYGROUND MAY BE USED TO TEACH NATURAL SCIENCES IN THE FOUNDATION PHASE

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Abstract

In South Africa, teaching Natural sciences in the Foundation phase, is informed by the curriculum. Teaching Natural sciences entails content, process skills and values. As the literacy levels of young learners is low, it is imperative that language learning and use is integrated in teaching Natural sciences. A reader titled Adventures in the Playground, videos of teaching lessons and a teaching pack were developed using an inquiry-based approach, to teach the science concepts - water, insects, conductors and insulators to Foundation phase learners. A question that informed this process was, how can the reader be used to teach the concepts to foundation phase learners. A qualitative, interpretive descriptive narrative was presented. The narrative was on the structure, the focus and the learning that is assisted, how it may be used. The setting for the reader provided an avenue to teach the science concepts in an integrated manner and a context that learners are familiar with, through the words and visuals (drawings) in the playground. Educating children through everyday experiences and encouraging thought is critically important. Therefore, teaching Natural sciences through the use of contextually relevant resources should be considered for greater knowledge, skill understanding, development and use, including positive values of science in the lives of young learners.
Keywords: foundation phase, natural sciences, inquiry-based teaching and learning, science concepts

https://doi.org/10.48127/gu/21.27.04

ISSN 2335-8408

Introduction

Since 1994, the demise of apartheid and the introduction of a democratic government, the education system in South African has undergone change. It comprises three strata, namely, general education and training, further education and training and higher education and training. The general education and training includes foundation, intermediate and senior phases. The Foundation Phase represents the initial stage of schooling, grades R – 3. This is where the "foundation for further learning is laid" (Department of Education, 20013, p. 19). This is the phase when the learners' love for science should start and be nurtured so that they may become critical thinkers and develop a curiosity about the world. The way in which Science is taught in the lower grades will determine if learners develop an interest in the subject. A love for Science needs to be nurtured from the time the child enters the schooling system in grade R (Beni, 2016).

Different curricular for the schooling sector, Grades R-12 have been implemented, since 1994. The current curriculum, Curriculum and Assessment Policy Statement (CAPS) was implemented in January 2012. CAPS for the Foundation phase comprises three subject areas: Numeracy, Literacy and Life Skills. Life Skills comprises six learning areas in its umbrella, and it is through this subject area, "Life Skills learners are exposed to a range of knowledge, skills and values that strengthen their awareness of technological processes and elementary science" (Department of Education, 2011, p. 5). Natural sciences is one of these learning areas, included as a component of Beginning Knowledge. Beginning Knowledge draws its content and concepts from Social Sciences (History and Geography); Natural Sciences and Technology.

Research on how foundation phase teachers interpreted the curriculum to enable them to teach Natural sciences, indicated that there was minimal guidance on how it should be taught, what resources to use, content topics were not specified, neither were possible instructional methods suggested (Beni, Stears & James, 2017). Professional development for pre-service and in-service teachers was required to enable them to be competent to address these aspects when teaching Natural sciences. In the context of pre-service education, it was expected that the teacher educators would focus on inquiry-based approaches that enabled the development of problem-solving skills as well as the process skills required when facilitating the pedagogy on how to teach Life skills, particularly Natural sciences. In the in-service education sector, extensive Natural sciences professional development programmes were developed and presented by the education advisors in the Department of Basic Education, in collaboration with academics from Higher Education institutions. The purposes of these programmes were for Foundation phase teachers to develop the competences required to address the curriculum issues, when teaching Natural sciences. The programmes included the integration of content, process skills and values. Also, since literacy levels of young learners in South Africa is low, as indicated by Progress in International Reading Literacy Study

ISSN 2335-8408

(PIRLS) in 2016, where the lowest performing country (mean score of 320) out of 50 countries (Howie, Combrinck, Roux, Tshele, Mokoena, & McLeod Palane, 2017). It is therefore imperative that literacy development and use is integrated in the teaching and learning of Natural sciences. An important aspect to consider is that the approach to be used when integrating language is the content approach, as knowledge exists and is encoded in texts (Bruce & Bishop, 2002).

A reader focusing on Adventures in the Playground, videos of lessons and a teaching pack were developed and used to teach science concepts - water, insects, conductors and insulators, to Foundation phase learners. Teachers were expected to develop an understanding of the concepts, inquiry-based teaching and learning (IBTL), as well as the skills to apply this approach in their own teaching, using the reader, videos and teaching pack. This article focuses on the reader and its use in teaching Natural sciences. Why is the reader only focused on? Now, in implementing the inquiry-based approach as stated earlier, a number of factors have to be considered. In working with the teaching and the learning strategy expected to be used – what if the teachers were not confident to work with the new approach, did not have access to the resources to implement practical work for the learners' hands on experiences to be achieved, what then could be done? The use of the reader could be an option for the inquiry-based teaching and learning experiences. We consider that The question that informed this process was, how can the reader – Adventures in the Playground be used to teach the concepts - water, insects, conductors and insulators to foundation phase learners?

Learning Natural sciences through Inquiry-based teaching and learning considers the meaning, types, resources, teacher knowledge and the pedagogic knowledge required to teach topics effectively. Inquiry learning is not new and can be traced back to the ideas of Dewey since 1938. Flick and Lederman (2006) maintain the inquiry-based science teaching as its central term, in that:

> Inquiry-based science teaching stands for the fundamental principle of how modern science is conducted. Inquiry refers to a variety of processes and ways of thinking that support the development of new knowledge in science. In addition to the doing of science, the inquiry also refers to knowledge about the processes scientists use to develop knowledge that is the nature of science itself. Thus, an inquiry-based science teaching is viewed as two different student outcomes, the ability to do scientific processes and the knowledge about the processes (p. 6).

In essence as indicated by Capps and Crawford (2013) inquiry is connected to the ways that a scientist studies the natural world, while inquiry learning and teaching are processes linked to the acquisition of knowledge by children and the pedagogy that teachers use to engage the children in inquiry, respectively. The inquiry-based approach embraces Constructivism as its principle learning theory, where there is active student participation, they are responsibly involved in the outcomes to be achieved, and viewed as problem solvers. The teacher is regarded as a guide or facilitator in the process (Spronken-Smith & Walker, 2010).

 https://doi.org/10.48127/gu/21.27.04

ISSN 2335-8408

Important aspects to consider with the implementation of the inquiry-based approach are teacher beliefs and context. In the South African context, the inquiry-based approach to be adopted should be workable for the teaching contexts. According to Ramnarain and Hlatswayo (2018), a particular type of pedagogical modification to the implementation of the inquiry-based approach may be adopted, for its enactment. In this instance, where resources are lacking, no laboratories at primary schools, low teacher attitudes to inquiry-based approaches, a reader could be the stimulation for the learners to be challenged, raise questions and develop the appropriate knowledge, based in a context that they encounter, or are familiar with.

Methodology

A qualitative, interpretive, descriptive narrative of how the reader may be used was undertaken. The analysis was on the structure, the focus and the learning that is assisted, how it can be used.

Teaching ideas – Adventures in the Playground

In this section I present a discussion on the structure, focus and the learning that is assisted, that is, how the reader may be used to engage learners in learning Natural sciences. The sample copies of the pages and the discussion on their use will be presented as well.

Structure of the reader

This reader comprises a cover and back page and 16 pages with text and visuals. Each set of pages has text on one page and a picture representing the text on the page next to it. Since this is a reader for Foundation phase, the words written and the sentence construction are simple. The level of reading, recognition and sounding of words, including their comprehension were considered, and the choice of words is simple. The language used is English and this reader would be used for first language speakers in this phase.

The focus

The focus is on the school garden. The garden is an open space with plant beds and play structures present.

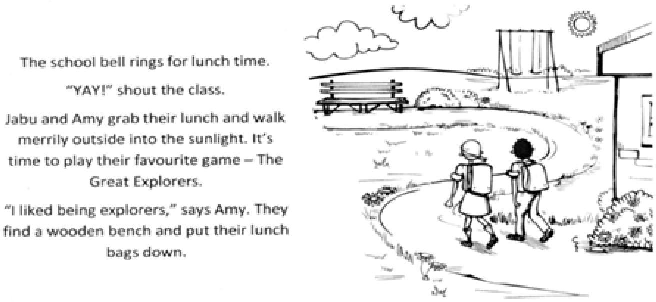
How the reader may be used to engage learners in learning science

In referring to the first two pages, see Figure one below:

ISSN 2335-8408

Figure 1

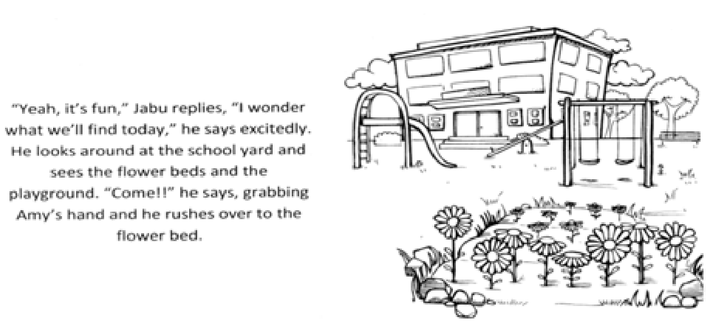
Pages One and Two of the Reader



So yeah, two children are seen arriving at school. You can quite clearly see from the picture that is presented that this setting is at a school. We have to take into account, when you're looking at this in the South African context, there are so many different cultural groups. So, whatever resource you were to be working with, you have to consider diversity and be inclusive of the various aspects – language, gender, race and culture. In this instance the reader is in English, and it was translated into the other 10 official languages, when required. In the Foundation phase this reader will be used with English First language mother tongue speakers. The names of the two learners walking into the school are Jabu (isiZulu name for a boy) and Amy (English name for a girl), and it is important that we are gender sensitive, as well. So, we are not going to have a whole lot of young boys together, or young girls together. And, obviously, if it's science that you're working with, then the word explore is so important. Also, we need to consider that within the South African context, nutrition and food sovereignty are big issues - many learners who go to school do not even take lunch to school, the school has to provide the lunch, funded by the Department of Basic Education. So, the presence of lunch bags is significant. The garden has plant and playground apparatus.

Figure 2

Pages Three and Four of the Reader



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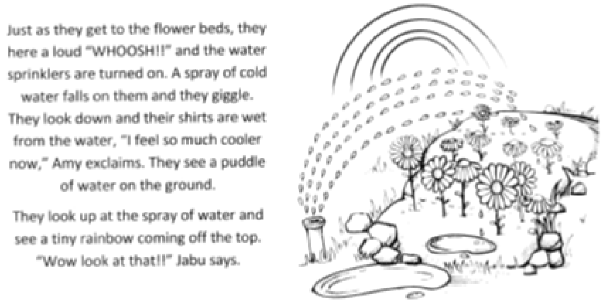
ISSN 2335-8408

The focus is fully on the garden and the fun aspect of exploring in the garden. The words fun, wonder, excitedly and rushing to the flower bed convey the spirit and excitement that this experience is for Jabu and Amy.

In referring to pages five and six, see figure three below:

Figure 3

Pages Five and Six of the Reader

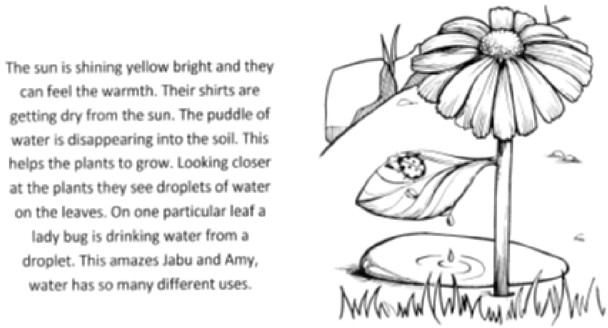


What we have to think about is that in order for plants to grow, watering has to take place. So, when we are speaking to our learners in the classroom about water and the importance of water, then we have to also think about and consider water not just in a beaker in the classroom, but water outside. It's a hot day and you've got water that's coming out of the sprinkler, and the light that is shining on those water droplets at an angle, there's a rainbow that is formed. Now, the awe and wonder with regard to science, and with regard to the questions and the engagement that the learners could be working with are being developed, important for the values development. So, within inquiry-based teaching and learning, depending on the model that you are using, (the one that we used was the 5 E model, which looked at engagement, exploration, explanation, elaboration, and evaluation), some of these may be used during the reading process. In looking at the visual presented, we can see the visual connections from the first image used to this image presented and how they are linked to the focus in terms of the text. Initially the garden was a small image, now the main feature. Learners may be questioned on what they observe, how did this develop from the former visuals and what could be expected just working with the visuals. So, a question to be asked could be - What do you think the next scene is going to be? And why do you think that?

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In referring to pages seven and eight, see figure four below:

Figure 4
Pages Seven and Eight of the Reader


The sun is shining yellow bright and they can feel the warmth. Their shirts are getting dry from the sun. The puddle of water is disappearing into the soil. This helps the plants to grow. Looking closer at the plants they see droplets of water on the leaves. On one particular leaf a lady bug is drinking water from a droplet. This amazes Jabu and Amy, water has so many different uses.

Your thoughts about what the next scene is and why it is the next scene may now be responded to and checked, when observing the visual on page eight. Now notice how we went from the garden being a small section to the garden taking centre stage to now a flowering plant in the garden. Look at how interrelationships in terms of biodiversity are also depicted. So, in looking at this, it talks about the children and the fact that they are taking off their shirts, as their shirts got wet when the sprinkler came on. Now the sun is out, and their shirts will get dry. Note the structure of the plant and the presence of the flower. Very interestingly, at this point another concept – insect is introduced. So, the concepts when working with this are in an interwoven manner, or in an integrated manner. We started off with water, and then we looked at insects. Okay, now, in terms of that interrelatedness, we can see quite clearly that there's a lady bird. Now start thinking, a lady bird and an insect. How do we look at the structure of this particular organism and start questioning? Why is it an insect? Why is it not for example, a spider (an arachnid), or crustacean? Why is it an insect? And you will notice that young children and even older children and students confuse classification of organisms all the time, they will tell you that insects are not animals. We have to ask ourselves questions about how we are talking and teaching about the concepts that learners right from primary school are being exposed to. Now note the focus is on the insect and the water - the insect is also drinking water? Questions could be raised about this interaction – Insects drink water?

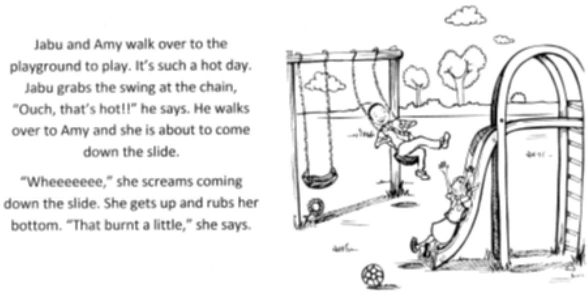
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In referring to pages nine and ten, see figure five below:

Figure 5

Pages Nine and Ten of the Reader

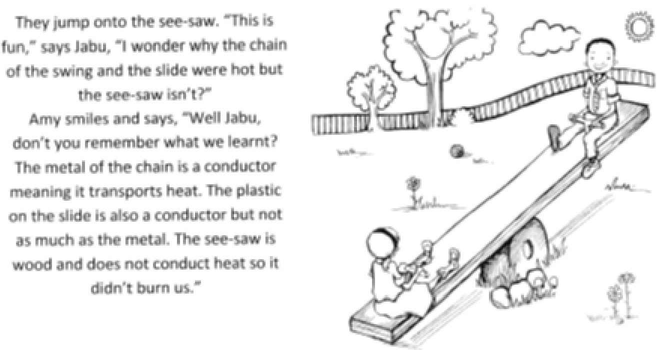


Note in the learners engaging with the swing and the slide - what concepts are being taught here? We are looking at metal, wood, the sun that is shining and the learners' activities. When we read what the children are saying – Jabu grabs the swing at the chain, and he says, ouch, that is hot. Amy comes down the side and she says that her bottom got burnt. What do you think is happening here? What are the concepts of conduction, or conductors and insulators? So even in our school classroom and now when the learners are playing, how do we then take all their different types of experiences and integrate the concepts of, for example, insulators conductors in the lesson?

In referring to pages eleven and twelve, see figure six below:

Figure 6

Pages Eleven and Twelve of the Reader

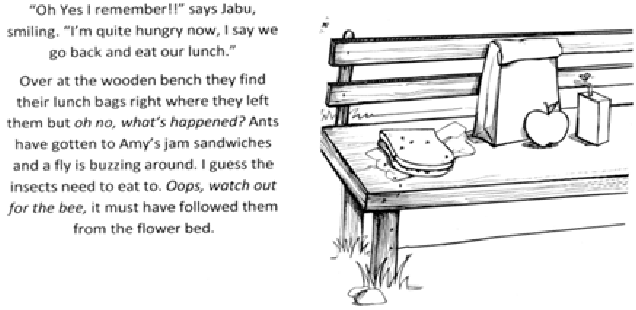


The learners then jump onto the see-saw. And they ask questions about the swing, slide and see-saw, where the latter is made out of wood. I wonder why the chain of the swing and the bottom of the slide were hot, but the see-saw is not. So, the learners raise the problem. The problematic that comes up, and now the children can go and investigate this using various types of devices, and not just

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the thermometer. They could be using their own bodies. And that's an important aspect. Five children using their bodies, what did they feel? Why do they feel that? But then, is that the most accurate way to actually measure? And what is important here, is the discussion that they have, Amy smiles and says, Well, Jabu, don't you remember what we learned? The metal of the chain is a conductor, meaning it transports (transfers) heat. The plastic on the slide is hot and here we can correct the thinking, as plastic is not a conductor of heat. The seesaw is wood, it does not conduct heat, so it didn't burn us.
In referring to pages thirteen and fourteen, see figure seven below:

Figure 7
Pages Thirteen and Fourteen of the Reader



Then we go on to the next pages, where they remembered where they had left their lunch. And when they get there, they find that obviously, there is another group of insects that are eating their lunch. But why? Why are those insects eating their lunch? What is it about the lunch? What is it about the insects? What contents are on the lunch, itself.

In referring to pages fifteen and sixteen, see figure eight:

Figure 8
Pages Fifteen and Sixteen in the Reader



In the last visual Amy and Jabu are sitting together as friends. If we look at the violence that happens in schools, we even as science educators, need to understand that our role is also looking at how social cohesion is so important, and how someone will be sharing their lunch with someone else. So, we can talk about

https://doi.org/10.48127/gu/21.27.04

ISSN 2335-8408

all the facts in science, we can talk about all the process skills, but what about the soft skills that our learners need to work with? All that can be integrated and worked with, as well. The adventure comes to an end.

Summing-up

The setting of the book in the playground provided an avenue to share science knowledge in a context that learners are familiar with. The learners learn the concepts of water, insects and plants in an integrated manner and not as isolated facts, through the words and visuals (drawings) presented. Learning Natural Sciences through contextually relevant resources should be considered for greater understanding and use of science. In many schools in South Africa, you will not observe the playground tools, neither will the buildings look like those in the visuals. We do though have to when we are working with any resources, and in working with the reader we have to put in what is the ideal, to get people to look at what it is that they can desire, and what it is that they can work towards. This is where we say we are using the asset-based approach. This is very important with any work that we do with our teachers. So, what is it that you have? What is it that you know, what is it that we can contribute together to build a bigger picture, and these are the things when we think about how we can all be co-constructors. We can also think about how the teachers are also learning so much knowledge, how they feel valued, how their confidence is also increased as well. In teaching and learning Science, the use of resources that are accessible, relevant, inspiring and also educational are essentially important.

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Cite as: James, A., James, L., Beni, S., & Stears, M. (2021). How a reader titled adventures in the playground may be used to teach natural sciences in the foundation phase. *Gamtamokslinis ugdymas bendrojo ugdymo mokykloje / Natural Science Education in a Comprehensive School, 27*, 4-14. https://doi.org/10.48127/gu/21.27.04